Air Exhaust tube and Fan for a toilet

Numerous patents have been issued over the years attempting to create a viable method of removing the bad air in a toilet bowl before it gets into the room and house .

BACKGROUND OF THE INVENTION

,Dan McGrew Pat Nu. # 3,938,201 had placed a large inlet opening cast into the rear of the bowl which would seem the most obvious and efficient means of extracting air from the bowl itself but his outlet channeling may have been inconvenient to installations or for a fan and other factors such as keeping the inlet and channels clean of toilet mist residue may have deterred acceptance .

A quiet and easy to install fan is a requirement of a ventilating system as is a practical venting outlet and many patents install the fan and the vent into the toilets casting ,creating a self contained unit ,however such modifications are expensive where Goodman Pat # 5,083,322 seems the simplest and viable but that approach may not be practical until consumer demand prompts the toilet industry to refine that option

External fans are often included in venting patents but most seem too unique and in the open however Happe, Pat Num # 6,016,576 does provide for a fan that inserts neatly into the bathroom wall which is attentive to consumer acceptance however he neglects the positioning of his unit and does not specify that it would have any kind of special outlet arrangement other then up to the roof.

Several patents specify that the fan's outlet is destined for the toilets sewer drain pipe where Shahar Pat Num # 6,173, 453 concentrates his fan on that advantage by inventing a valve and merging it with his fan with said housings being formed to integrate in the toilets architecture however its limitations are inherent with the housings configuration and attachment to the toilet .

What's needed is an easy to install fan valve assembly compatible with the toilet and sewer outlet similar to McGrew who's Patent has an air line from the center back of the toilet to its vent stack however he has no room for a fan in the bathroom where it would be easy to service and clean .

A properly designed and placed fan could solve several of the problems holding back a venting toilet.

SUMMERY OF THE INVENTION

The invention makes an improvement to standard toilet ventilation systems that have a dry, air inlet ,where a method of keeping the air inlet and channels clean of toilet bowl flush mist is invented by directing the air flow up into the area above the tank water via an up lift channel , similar to an overflow tube and that tube has a hole connecting it to the flush channel so that it fills with water during the flush . Flush water flowing into the uplift tube cleans the inlet and blocks the fan from sucking up any dirty mist and the tank float's refill tube could also flow into it , not the overflow tube ,which could be eliminated. The uplift tube expels its air into the tank from where air would be removed by a tank venting system.

A second improvement to both flush channel and dry air channel systems that use an external vacuum is the precise location of the air exhaust fan , putting it in the wall below the right half of the tank and an air block valve is integrated in the fan housing to keep out gas when connected to a sewer.

The fan configuration and attachments provides for easy installation , cleaning , and replacement . .

A specific type of valve is provided with attributes that make it easy to open with fan pressure and to seal well without sticking open or closed due to the buildup of toilet bowl residues .

Brief description of the drawings

Fig . 1 Fig 1 shows the cutaway side profile of a unified bowl tank toilet

Fig. 2 Fig. 2 shows the front cutaway view of a small centrifical fan with a valve

Fig 3 Fig 3 shows a cutaway side view off the fan and valve in figure 2

Fig 4 Fig 4 shows the same view of the fan from fig 2 except the valve is placed lower.

Fig 5 Fig 5 shows four different views of the valve in fig 3 where three are variations .

Fig 6 Fig 6 shows a more detailed cutaway view of the fan in fig. 2 with two parts.

Fig 7 Fig 7 shows the front of the fan in Fig 6 with its cover removed with two tightening knobs

Fig. 8 Fig 8 shows two versions of the knob in fig 7 with a frontal and side view of each

Fig 9 Fig 9 shows the fan of fig 7 behind a standard toilet with a part of the bowl and tank cutaway.

Fig 10 Fig 10 shows the fan in fig 9 with the wall removed and a cutaway vent stack.

Fig 11 Fig 11 shows two pipes cutaway to reveal two hose connections from the fan to the pipe.

Detailed description of the preferred Embodiments

All of the drawings show components that would operate in a ventilating toilet system which include a modified toilet plus a fan which has an air valve combined with it to expel its air into a vent stack

Figure 1 shows the cutaway profile of the rear of a toilet 5 where 4 is the standard flush channel . The toilets air inlet 3 is situated just behind the flush channel at the rear of the toilets rim and could be a couple inches wide either centered or offset as would be the preference of the manufacturer. The air inlet 3 is connected to an uplift tube 1 which has an open top above the tank water line where air would be drawn up by a vacuum from a tank venting system such as with tube 6 and the separation between the tube tops help keeps the fan from ingesting water from tube 1. The flush channel 4 has a hole 2 which pours flush water into the uplift tube during the flush which has a blocking effect keeping dirty bowl flush mist out of the uplift tube and cleaning it .

Figure two shows the cutaway of a small centrifical fan about 4 inches wide where the fan disc 8 has fan paddles 9 turning counter clockwise although it could also be a drum type with more fins . The fans outlet 7 has a valve in it which would keep air from backing up into the fan when its off where the valve shown 10 is a simple flap type which closes by gravity and opens by the fans pressure. The valve could also be a simple butterfly as is common to many bath fans but which do not seal.

Figure 3 shows the end view of the flap valve 10 in fig 2 where its main body 12 is made of a solid such as a plastic and it has a fringe of rubber around it 11 which seals against the valves seat 13. The plastic part of the valve rests on the seat taking its weight while the rubber only has to seal where the seat's angled facing allows the rubber to seal even if the valve is warped out of shape .

Figure four is the same view as fig. two except the valve is at an angle and closer to the fan paddles which allows the air force of the fan to act even stronger on the valve which could also be curved. A curved valve could be hinged lower 14 then a flat valve requiring a less lengthy exhaust flange . The valve could also have a simple rubber surface resting on a typical seat with a solid ridge .

Figure five shows a group of three valves 12 with the rubber fringe attached in different ways where the top has a rubber sheet glued or otherwise attached to the top surface and the second the bottom and the last has the rubber sandwiched between two pieces of solid material such as a plastic. 5 shows the top view of valve and its fringe 11 with a simple hinge 14 which could also be lengthwise.

Figure six is the profile of the fan in fig two cutaway to show several features specific to its usage. The Fan has a circular cover 16 which inserts into the fan body recession 22 and is then turned and locked into place by the grasping of the indentation of 17 by the protrusion 18, a common attachment. The cover has an interior rim 19 which helps seal and direct the fan's air flow out and when removed exposes the fan 9 which has a large hub with a large rectangle slot for easy removal and replacement. Easy removal of the cover and fan blade is important for cleaning those parts and the fans housing. This fan has its motor in its own compartment and does not mix its air with the fans main chamber. The fans housing has a slanted surface 15 across the top rear back part of the housing that would grasp the wall board from 3/8 to one half inches and pinch it holding it tight and firm to the wall. The valve in figure six has its hinge on its side being that closest to the wall so that the exhaust flange can be angled out somewhat allowing clearance between it and the inside of the wall for the hose attachment and to make it easier to slide the housing up into the wall opening which is a significant feature . The other way of creating clearance, if the valve was hinged on its end would be to simply extend the fan and its motor deeper into the wall to allow full functioning of the valve in figure 2 but the lower hinge position of a curved valve fig 4 would not need as much depth to satisfy clearance .

Figure seven shows the fan in figure 6 from the front with several features and the cover removed . 18 is one of the three latching protrusions that would hold the cover and 21 is a control knob for a rheostat which would control the speed of the motor which could be 12,24 or 110 volts. There are two knobs 23 that would be turned by a screwdriver which moves a cam on the inside which pushes on the bottom edge of the wallboard or on a flat spring 29 protruding under each cam .

Figure eight shows two versions of the cam knobs where 23 is a one piece cam element held to the housing like a rivet by the flaring of 28 where the cam could have a curved end to grasp the wallboard . The interior of the cam also has bumps on it 25 which act on a spring protrusion of the housing 24 which locks the cam in a set position by clicking from one position to another when turning . The second cam type has an angled piece 26 riveted 27 to the cam which presses on the wallboard and a tab protrusion from its front instead of a screwdriver slot so it can be turned by fingers.

Figure nine shows the positioning of the vent fan 30 revealed behind the cutaway view of the toilet bowl emphasizing its location below the vent exhaust tube 6 which draws air from the toilets bowl via the tank The lining up of the fan with the exhaust tube provides for the easy connection of a hose from one to the other The location of the fan is also a factor of the fans connection to the toilets 4 inch vent stack behind the wall which is revealed in Figure 10 which shows it with the wall removed where the fan is venting into the stack. The fans hose 31 has an upward bow in it which keep any liquids in the stack from splashing up into the fan and the stack attachment flange 33 which is strapped to the stack has an upward tilt where the hose connects . The extra hose in the upward bow also allows the fan to be removed from the wall with the hose still attached where the hose can be easily removed from the fan and reattached after cleaning or to a replacement fan . The installation of the fan especially in old construction would be easier with a prefabricated transformer 36 which would have a 10 to 15 foot low voltage wires going to the fan and attaching with a standard plug and a 10 foot or so 110 volt wire formed with the transformer which would be attached to a bath light . The wire plug at the fan would be help full to those who would remove the fan occasionally for cleaning .

Figure eleven shows the positioning of a pipe above the fan if it was venting up into the addict and roof where the fans hose would be an accordion type for the first foot